Are high-IQ students more at risk of school failure?

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A B S T R A C T

While it is well-established that intelligence tests positively predict academic achievement, there remain widespread beliefs that gifted students experience difficulties at school and are particularly at risk of school failure. Many studies have provided evidence to the contrary, however few were based on representative population samples. This paper intended to assess whether prior results on the academic success of gifted children could be generalized to a large sample from the general French population. We analyzed a database of French middle school students (N = 30,489), including scores in a fluid intelligence test in grade 6 and a variety of school performance measures in grade 9 (results at a national exam, teachers' grades, academic orientation in high school). In addition, self-efficacy and motivation were assessed. Our results replicate and extend previous findings: high-IQ students scored much better on all academic performance measures, which was corroborated by higher levels of motivation and self-efficacy. Consistently with the previous literature, there was a robust positive relationship between fluid intelligence in grade 6 and academic performance in grade 9 in the whole sample, which was also observed within high-IQ students. Exploratory analyses revealed that IQ moderated the association between social background and children's achievement, such that the positive link between parental education and achievement levelled off for high-IQ children. The positive association between high-IQ and achievement was similar for boys and girls.

1. Introduction

Intelligence tests were originally designed with the explicit purpose of predicting school success (Binet & Simon, 1904). Since then, after a century of further development of tests and theorising, scores provided by intelligence tests remain a robust predictor of academic achievement (Deary, Strand, Smith, & Fernandes, 2007; Rohde & Thompson, 2007; Roth et al., 2015). More generally, IQ is positively correlated with a large array of life outcomes, including income (Zagorsky, 2007), mental and physical health (Der, Batty, & Deary, 2009; Gale, Hatch, Batty, & Deary, 2009), or life expectancy (Batty, Deary, & Gottfredson, 2007).

In this context, it may seem surprising that there remain widespread beliefs about gifted children suffering from social and emotional difficulties. For example, the National Association for Gifted Children states that gifted children "may be at greater risk for specific kinds of social-emotional difficulties if their needs are not met", such as "heightened awareness, anxiety, perfectionism, stress, issues with peer relationships,

and concerns with identity and fit" ('Social & Emotional Issues | National Association for Gifted Children', 2018). Similarly, on the website of the National Register of Health Service Psychologists, James T. Webb writes that many professionals "are unaware that talented and gifted children are at risk for underachievement, peer relationship issues, power struggles, perfectionism, existential depression, and other problems, and that bright adults often have job difficulties, problems with peers, spouses or children, and existential depression that stem from giftedness." (Webb, 2014). These beliefs are supported by studies that show positive associations between high IQ and anxiety (Lancon et al., 2015), depression (Jackson & Peterson, 2003), internalizing and externalizing problems (Guénolé et al., 2013) and various psychological and physiological disorders (Karpinski, Kinase Kolb, Tetreault, & Borowski, 2018). However, these studies relied on case studies or biased samples (such as members of Mensa in Karpinski et al. (2018),[1] or clinically referred children in Guénolé et al. (2013)).

Even more surprising, some people seem to think that gifted

children are more at risk of school failure, potentially due to the above mentioned social and emotional problems, but also to lower self-efficacy or motivation (Reis & McCoach, 2000), heightened risk of bullying (Peterson & Ray, 2006), boredom in class (Vannetzel, 2009) or perfectionism (Webb, 2014) – even though some studies argue against these hypotheses (Feldhusen & Kroll, 1991; McCoach & Siegle, 2003; Peters & Bain, 2011; Roznowski, Hong, & Reith, 2000). Other authors argue in favour of the existence of a "negative Pygmalion effect", that would encourage the child to conform to its environment and the lower demands of the school in order to be accepted by others, which, as a consequence, would increase socio-emotional problems and heighten the risk of failure (Terrassier, 2009). Thus, popular media report that 20% of gifted student may drop out of school in the US (Kuzujanakis, 2013), while in France, the reported proportion of gifted children failing at school goes from one third (Bourgeois, 2017; Colonat, 2018; Le Saint, 2017) to up to 70% (Quillet, 2012). Here again, these figures are supported by little evidence, or come from biased samples – e.g. the estimate of one third of failing gifted students in France comes from a survey of parents of children belonging to the French Association for Gifted Children (Côte, 2005).

In contrast, scientific evidence converges towards the fact that gifted students perform better than their peers. The literature on the achievement of gifted students goes back to the 1920s with Terman's Study of the Gifted (Terman, 1926a). This longitudinal study examined the characteristics and development of 1528 high-IQ children in California, aged 2 to 13 at the beginning of the study. Gifted students from the main experimental group were selected in Californian public schools by the means of a three-step process involving teacher nomination, the National Intelligence Test, and an abbreviated version of the Stanford-Binet test (belonging to the top 1%). Results showed that the gifted participants were rated higher by teachers on the quality of their school work compared to a control group (Terman, 1926b), and performed better at the Stanford Achievement Tests by two to five times the standard deviation of the controls (Terman, 1926c). Starting in the 1970s, the Study of Mathematically Precocious Youth (SMPY) followed five cohorts of American gifted students. The first three cohorts were identified at 12–13 years old by talent searches and selected with scores at the mathematics and verbal subtests of the SAT (Lubinski & Benbow, 2006). The first cohort included 2188 students in the top 1%, the second, those in the top 0.5% ($N = 778$), the third, those in the top 0.01% ($N = 501$). By age 33, 25% of participants of the first cohort had earned a doctorate, 30% of cohort 2, and 50% of cohort 3 – compared to 1% in the general population (Lubinski & Benbow, 2006). Similarly, McCoach and Siegle (2003) have shown that gifted university students in the US (identified by school district volunteers) have higher self-reported Grade Point Averages (GPAs) than students from the general population, but their sample was small and not representative. Matthews (2006) also reported that in North Carolina, less than 1% of gifted high-school students (as identified by a talent search) dropped out. However, a common limitation to these studies is their respective selection process. Indeed, they relied on teacher nomination or talent searches, which may have favoured the inclusion of academically successful gifted students in the gifted sample at the expense of low achievers, thus potentially amplifying the difference between gifted and controls. Overcoming this limitation, Roznowski et al. (2000) led a large scale study examining various academic outcomes among 12,630 American gifted and non-gifted students from the general population. Their results show that gifted individuals (top 5%) are more likely to participate in college preparatory programs, receive A and B grades in school, spend more time on homework, be less absent, like school more, feel more at ease in academic courses, and have higher self-esteem. However, their measure of cognitive ability relied on highly academic skills (they used a composite score of vocabulary, reading and arithmetic tests – BYTEST), which considerably reduces the strength of their results.

While the belief that high-IQ student are more at risk of school failure has not been supported by the literature and seems contradictory with the generally positive correlation between IQ and achievement, it is not inconceivable that this relationship might reverse or at least level off beyond a certain IQ level, such that individuals with very high IQ might succeed less well than expected from the linear relationship observed in non-gifted children. Again, this threshold hypothesis has not been supported by the literature, as a series of studies showed the existence of differences in degrees earned and other indicators of success depending on ability levels, even within the highly gifted SMPY population (Park, Lubinski, & Benbow, 2008; Robertson, Smeets, Lubinski, & Benbow, 2010).

These findings together indicate that gifted students, far from being worse off at school, outperform their peers. However, most of these studies involved nomination or talent search as a selection step in order to find gifted participants, which implies that the participants in these studies may be biased in favour of successful gifted children. Therefore, these results were often based on non-representative samples, so that there remains a need for research on the gifted in the general population. Besides, these studies where all conducted in the United States, which raises the question of the generalisability of their findings in other countries.

In order to test whether previous results on the academic performance of gifted students could be replicated in a large representative sample and in a different population, we analyzed data from 30,489 French middle school students. Giftedness is a very broad term, which can refer to superior abilities in multiple domains, such as general intellectual ability, leadership skills, or visual/performing arts. In this paper, we investigate intellectual giftedness, i.e. superior general intellectual ability. The data used includes scores in a fluid intelligence test in grade 6 and a variety of school performance measures in grade 9 (results at a national exam, teachers' grades, academic orientation in high school). In addition, self-efficacy and motivation were assessed. This rich database thus allowed us to study the differences in a large range of school performance measures between gifted and non-gifted students in France.

In accordance with the existing literature, we formulated the following hypotheses:

a) High-IQ students show better academic achievement than other students.
b) They drop out less frequently from middle school.
c) High-IQ students show higher scores in measures of self-efficacy and motivation.
d) There is a positive relationship between IQ in 6th grade and achievement in 9th grade.
e) This relationship holds equally in high-IQ students and in the general population.

2. Method

2.1. Sample

We analyzed data from the DEPP Panel 2007, a study directed by the Direction de l'Evaluation, de la Prospective et de la Performance (DEPP), French Ministry of Education (Trosseille, Champault, & Lieury, 2013). 34,986 children were followed from their entrance in the first year of French middle school (grade 6) in 2007 to the second year of high school (grade 11). The study was compulsory and approved by the National Council for Statistical Information (CNIS) (visa n°2008A061ED and 2011A082ED), ensuring public interest and conformity with ethical, statistical and confidentiality standards. The sampling strategy was balanced sampling, i.e. the random selection of a sample that is representative of the sampling frame based on available characteristics, using the algorithm CUBE created by INSEE (Rousseau & Tardieu, 2004). The sample was randomly selected from an exhaustive sampling frame, the *Système d'information du second degré de la DEPP*, balancing